Finding Flaws. — Every scientific man knows that science is progressing and ideas are changing. Aristotle's writings on animals read strangely to-day, but we are not therefore to lay stress on his limitations. Darwin wrote the first edition of the *Origin of Species* over forty years ago, and it would be strange indeed if every part of it were acceptable to-day. Every bit of Darwin's earlier evolutionary writings was not acceptable to Darwin himself before he died — a fact to be put down to his credit. The author of this book[1] devotes over three hundred pages to pointing out Darwin's changes of views, "special errors and inconsistencies," "looseness and contradictions." Some of the "flaws" which the author holds up to view and takes great delight in pointing to again and again belong to the category of natural advances in knowledge; others are still debatable points; in other cases the author seems to be straining things to make a point. The worst of it is that the whole book is written in a style of oiled fluency, cocksureness, and conceit, which makes the reader doubt the author's sincerity. Thus on page 193:

> I have tried to understand many things, but Mr. Darwin I cannot understand. You cannot have "uniformity of conditions" and uniformitarianism of process and result too; for the one is based on fixity and the other on fluctuation — it may be slow, but ceaseless — though it may be very, very slow, yet also of a necessity very, very sure. Hegel's Absolute was always a becoming; phenomena, conditions, are always a-coming and a-going; it is because of this that they are phenomena and conditions, and to have to write thus in the year of grace 1899, in reference to the work not only of a great naturalist but of a thinker, makes me rather ashamed of falling back so much and so fully on what I was well taught in the logic and metaphysic class-room of Edinburgh University by the worthy successor of Sir William Hamilton, "forty years ago, my boys, forty years ago."

But after all, if only one can be undisturbed by these personal things, he will find in the book many interesting facts which the author has collected and which are new to speculative books of this sort.

Recent Work in Electrotaxis. — In two papers[2] published within the year, Dr. Oskar Carlgren has considerably advanced our

[1] Alexander, P. V. *Darwin and Darwinism, Pure and Mixed.* A Criticism, with Some Suggestions. London, John Bole, Sons, and Danielson, 1899. 346 pp.

[2] Carlgren, O. Ueber die Einwirkung des constanten galvanischen Stromes auf niedere Organismen, *Arch. Anat. u. Physiol.*, Physiol. Abth., 1900, pp. 49–76.

Carlgren, O. Ueber die Einwirkung u. s. w.: Zweite Mittheilung: Versuche an verschiedenen Entwicklungsstadien einiger Evertebraten, *Arch. Anat. u. Physiol.*, Physiol. Abth., 1900, pp. 465–480.

knowledge in regard to the action of the constant electric current on lower organisms. The work bears evidence of having been carefully and well done. The first of the two papers is principally given to a description of the electrotactic reactions of Volvox, introduced by a brief account of the normal movements of the animals based largely on the results of Klein and Rösel. He finds the sense of the response to the current to be kathodic immediately after the circuit is completed. After the current has been passing for some time, however, this kathodic response becomes less and less evident, until finally there ensues a more or less distinct anodic movement; but this latter never becomes so well marked as the previous motion towards the kathode. If the Volvox is placed in a thin gelatine solution, so that it remains alive but is unable to move, very striking changes in the form of the body accompany the action of the current. The anode side of the colony becomes wrinkled and crumpled together, while the kathode side is correspondingly swollen out. These phenomena become more apparent the longer the current acts, and take place without relation to the orientation of the axis of the body with reference to the current direction. At the same time all the parthenogonidia move towards the anode side of the colony. This movement is evidently an entirely passive one, since it occurs regularly in all stages of their development, as well before they are able to move actively as after. That the change in body form is of a purely passive character is evidenced by the fact that it takes place in the same way in colonies which have been killed in formalin. To extend the results the effect of the current was tried on lifeless individuals of *Paramecium aurelia* and *bursaria*, *Colpidium colpoda*, and Amœbæ of different species, and in all these cases there resulted the anode crumpling and the kathode swelling. In his theoretical discussion Carlgren advances the view that the effect of the current on organisms is to a certain extent of a purely physical nature. He believes that this physical action is of extreme importance, but does not attempt to make it account for all the facts. His results make it evident that in any future work on the subject this factor must at least be considered.

In the second paper there is a detailed account of the electrotactic response of the larvæ and embryos of a number of marine invertebrates. The point of greatest general interest is in regard to the reactions of the larvæ of certain echinoderms (*Strongylocentrotus lividus*, *Sphærechinus granularis*, *Ophiotrix fragilis*, and *Asteracanthion glacialis*). Young free-swimming stages of these animals gave

no response whatever. Older larvæ, Plutei and Bipennariæ, became oriented in stronger currents and went to the kathode. Again at a later stage of development the electrotaxis completely disappears. All theoretical discussion of the results is left for a future paper.

In view of the character of the papers here reviewed, particularly the first, further work along the same lines by Dr. Carlgren will be awaited with interest.

RAYMOND PEARL.

ZOÖLOGY.

An Introduction to Zoölogy.[1] — In twenty chapters the authors take up successively the grasshopper, the butterfly, the beetle, the fly, the lithobius, the spider, the crayfish, daphnia, the earthworm, nereis, the slug, the fresh-water clam, the starfish, the hydra, paramœcium, the smelt, the newt, the lizard, the English sparrow, the mouse. In each the type and "its allies" are described from a general natural-history standpoint and with an appended key to the chief representatives of the group. A last chapter deals briefly with the development of the frog's egg.

Then in one appendix we find the stimulating outlines of laboratory work upon each of the above twenty-one forms that was proposed for entrance requirement at the Lawrence Scientific School, Harvard University. A second enumerates more than one hundred works and papers of reference; and a third gives a useful classification of the animal kingdom, with brief distinguishing characters of larger groups and references to the pages of this work, in which orders and families are mentioned. An index and glossary conclude the four hundred and twelve pages.

The book is well described in the preface: "The general plan of this text-book is at the same time both old and new. Old, because it attempts to restore the old-time instruction in Natural History; new, because Natural History is not to-day what it was a generation ago. The treatment will seem new also in contrast with modern text-books of zoölogy, since they are devoted primarily to comparative anatomy, a field upon which we lay little stress. . . . It is a guide to the study of animals, which it is hoped may introduce many

[1] Davenport, C. B. and G. C. *Introduction to Zoölogy.* A Guide to the Study of Animals, for the use of Secondary Schools. New York, Macmillan, 1900. xii + 412 pp., 306 figs.